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It is also understood that the above constructs are examples of constructs useful in the methods described herein, but that the invention encompasses functional equivalents of such constructs.

5 The term "vector" is understood to generally refer to the vehicle by which the nucleotide sequence is introduced into the cell. It is not intended to be limited to any specific sequence. The vector could itself be the nucleotide sequence that activates the endogenous gene or could contain the sequence that activates the endogenous gene. Thus, the vector could be simply a linear or circular polynucleotide containing essentially only those sequences necessary for
10 activation, or could be these sequences in a larger polynucleotide or other construct such as a DNA or RNA viral genome, a whole virion, or other biological construct used to introduce the critical nucleotide sequences into a cell.

The vector can contain DNA sequences that exist in nature or that have been created by genetic engineering or synthetic processes.

15 The construct, upon nonhomologous integration into the genome of a cell, can activate expression of an endogenous gene. Expression of the endogenous gene may result in production of full length protein, or in production of a truncated biologically active form of the endogenous protein, depending on the integration site (e.g., upstream region versus intron 2). The activated gene may
20 be a known gene (e.g., previously cloned or characterized) or unknown gene (previously not cloned or characterized). The function of the gene may be known or unknown.

Examples of proteins with known activities include, but are not limited to, cytokines, growth factors, enzymes, structural proteins, cell surface receptors,
25 intracellular receptors, hormones, antibodies, and transcription factors. Specific examples of known proteins that can be produced by this method include, but are not limited to, erythropoietin, insulin, growth hormone, glucocerebrosidase, tissue plasminogen activator, granulocyte-colony stimulating factor, granulocyte/macrophage colony stimulating factor, interferon α , interferon β ,
30 interferon γ , interleukin-2, interleukin-6, interleukin-11, interleukin-12, TGF β ,

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construct used to introduce the critical nucleotide sequences into a cell. It is also understood that the phrase "vector construct" or the term "construct" may be used interchangeably with the term "vector" herein.

The vector can contain DNA sequences that exist in nature or that have been created by genetic engineering or synthetic processes.

The construct, upon nonhomologous integration into the genome of a cell, can activate expression of an endogenous gene. Expression of the endogenous gene may result in production of full length protein, or in production of a truncated biologically active form of the endogenous protein, depending on the integration site (e.g., upstream region versus intron 2). The activated gene may be a known gene (e.g., previously cloned or characterized) or unknown gene (previously not cloned or characterized). The function of the gene may be known or unknown.

Examples of proteins with known activities include, but are not limited to, cytokines, growth factors, neurotransmitters, enzymes, structural proteins, cell surface receptors, intracellular receptors, hormones, antibodies, and transcription factors. Specific examples of known proteins that can be produced by this method include, but are not limited to, erythropoietin, insulin, growth hormone, glucocerebrosidase, tissue plasminogen activator, granulocyte-colony stimulating factor (G-CSF), granulocyte/macrophage colony stimulating factor (GM-CSF), macrophage colony-stimulating factor (M-CSF) interferon α , interferon β , interferon γ , interleukin-2, interleukin-3, interleukin-4, interleukin-6, interleukin-8, interleukin-10, interleukin-11, interleukin-12, interleukin-13, interleukin-14, TGF- β , blood clotting factor V, blood clotting factor VII, blood clotting factor VIII, blood clotting factor IX, blood clotting factor X, TSH- β , bone growth factor-2, bone growth factor-7, tumor necrosis factor, alpha-1 antitrypsin, anti-thrombin III, leukemia inhibitory factor, glucagon, Protein C, protein kinase C, stem cell factor, follicle stimulating hormone β , urokinase, nerve growth factors, insulin-like growth factors, insulinotropin, parathyroid hormone, lactoferrin, complement inhibitors, platelet derived growth factor, keratinocyte